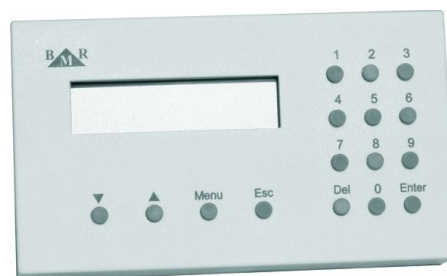


BMR IRC heating control system

Systems with hot-water heating

Systems with direct electric convectors, mattings and foils

Systems with block storage heaters



version 1.2

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1. General introduction and description

Solving of the regulation system design can be divided into two parts:

- **Heating source control.**
- **Heating control for particular rooms.** System is based on so called IRC (Individual Room Control) regulation. IRC is temperature control in every room according to time table set by user.

This installation manual provides information about IRC system design and installation.

BMR offers two IRC regulation systems:

- **RNET regulation system.** It is programmable control system for **heating regulation of buildings with hot-water radiators or floor and block storage heaters.** In the maximal configuration it can contain 16 control section where every control section controls up to 32 regulators. Whole system is able regulate temperature in 512 rooms.
- **RT regulation system.** It is programmable control system for **heating regulation of buildings with direct electric convectors, heating matings and foils.** In the maximal configuration it can contain 16 control section where every control section controls up to 32 regulators. Whole system is able regulate temperature in 512 rooms.

Both systems are principally very similar. Used control station is the same, similar are thermostatic room sensors and optional control software for PC. Systems are different only in control of heating source. For hot-water system RNET, thermostatic sensors control thermo-drives on the radiators in the rooms, eventually ventilator for electric storage radiator. RT system controls electric heating convectors or matings by auxiliary power control unit. For switching of convectors or matting, semiconductor switchers are used. Both systems can be combined together.

Main advantages:

- efficiency – up to 30 % energy saved
- comfort – heating is controlled absolutely automatically including the time changes summer/winter time
- easy setting and operation
- high reliability and working life. First installations are in the operation for more than 13 years
- 36 months warranty
- possibility to connect controllers into a system for large objects heating
- possibility to set and control system remotely by PC

Great advantage of regulation systems RT and RNET is the method of the object heating control. Temperature in every room can be programmed independently on the rest of the object. Mode can be the same for whole week or different for every day in the week. Temperature is possible be changed eight times per day in the mode.

Room heating program for whole object can be turned to the low consumption mode (LOW regime) manually or it can be set by day and time. Normal mode is restored by the same way. This feature is very useful for longer planned absence from building. For example when the family is leaving for the holiday and returning back to the comfortable heated house while the house was kept on the low temperature during their absence.

Whole regulation system is modular and it is possible and easy to design it on the customer request and heating system structure.

2. RNET – control system for hot-water heating

RNET regulators can control heating at hot-water systems with radiators and also with heated floor. System RNET for hot-water system creates communication network, which connects all system components through.

Indoor thermostatic sensors for RNET system are not only passive temperature sensors, but they are based on intelligent microprocessor control, which provides data and commands exchange with control section. This type of sensors is called digital. Every single element of the system is identified by unique address defined by switches on the sensor. Other special devices, for example end item, are identified by unique address defined by producer.

Within the regulation system RNET, every thermostatic sensor is counted as one control channel of the system. One control section can operate with maximum of 32 thermostatic sensors. One programmable thermostatic sensor can control up to 10 thermo-drive units. This feature is very useful for schools, conference rooms, hospitals, etc.

2.1. Description of parts

Regulation system is based on elements, which can be defined as two following groups:

- **Basic elements.** Basic elements are necessary for every regulator and neither one can be left out. Basis for the system is control section with power supply unit, programmable thermostatic sensors and thermo-drive units.
- **Additional elements.** Additional elements increase comfort and improve some features of regulation system. However their usage is not essential. In the group of additional elements there can be found:
 - end-item K1_NET
 - window contact OK_NET
 - LOW modem for GSM control
 - interface RPC_USB for remote control via PC

2.2. Basic elements

2.2.1. The Control Unit

Control station RNET_P4 makes possible to set days or weeks regulation schedules for up to 32 independent heating circuits. It displays real temperature in every heating circuit and it allows its precise calibration directly from control section.

It is possible to set up to 8 different temperature changes in one day, at any time and for any value. Alpha-numerical display with 2x16 digits and keyboard with 16 keys make all settings to be done very easily. Part of the control section delivery is also power supply 24V AC / 2,5A. It supplies control section, thermostatic sensors and thermo-drive units.



Control station has two basic operation modes. User mode, which allows displaying room temperature, defining temperature profile, etc. Service (administrator) mode, protected by password, which is supposed to be used for essential setting of heating system, for example number of sensors, date and times for time change and temperature calibration for every sensor.

Technical features

Supply voltage	24 V DC
Consumption	0,3 W
Date and time backup	24 hours
Configuration backup	10 years

Control section must be placed on common three-wires bus network to the place where the user will make all actions. If the system is equipped by PC, it can be actually placed on any even invisible place. Personal computer is connected to the control section via RS485 line. See connection diagrams at appendix.

2.2.2. Programmable thermostats

According to a customer specification three types of thermostat can be offered:

CD_NET – basic type. It has a built-in temperature sensor and an output for controlling a thermo-drive unit. Programmable thermostat is an independent regulation unit working as a PI (proportional integration) controller which

communicates with the control section from which it gets the information about the targeted temperature. On the contrary it provides information about the measured temperature and thermo-drive unit status to control section.



CD_NET_D – thermostat with LCD which shows current temperature and thermo-drive unit status. For switching for 230V AC, an external relay is necessary.



CD_NET_DN – thermostat with LCD and buttons. Display shows current temperature and thermo-drive unit status. Unit is equipped with buttons for local temperature setting independently from the temperature profile. Manually set temperature is kept till the next temperature change, according to the time program. For 230V AC switching, an external relay is necessary.



Thermostats are available at design ABB (Tango, Element, Time, Alpha Exclusive Palladium or Titan), Schneider – Telemecanique (Unica TOP, Unica Plus, Unica Colors and Unica Basics). Other designs on the request.

! Important

All sensors measure with accuracy 1°C. This accuracy is absolutely sufficient for measurement of room temperature. Nevertheless sensor can be calibrated on higher accuracy.

For heating systems with block storage heaters, their ventilator for 230 VAC is connected via external relay on terminals labeled “valve”. Control voltage relay has to be 24 VDC. If relay is glimmering it is recommended to connect

RC element ($220\ \Omega + 470\ \mu\text{F}/35\text{V}$) on terminals of relay control voltage. See chapter 4.

2.2.3. Thermo-drive unit

Thermo-drive unit is system actuator, which either opens or closes hot water inlet to the heater through the valve. Standard system design counts with thermo-drives units with control voltage of 24 VDC. One thermo-drive unit has consumption 33 mA at 24 V. One programmable thermostat can control up to 10 thermo-drive units connected in parallel. Nevertheless total current demand has to be less than 500 mA.

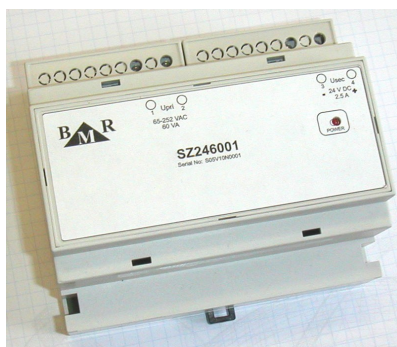
Thermo-drive unit is delivered with supply lead of 0,5 m. In case that thermo-drive units from other producers are used in the system it is necessary to count with higher drive current, which is passing for 30 seconds. Forgetting this can cause system overloading and its damage.



Thermo-drive unit is designed for valves from: HEIMER, SIEMENS, HONEYWELL, HERZ, LANDYS. It is not possible to directly use sockets from GIACOMINI and DANFOSS (reduction needed).

2.2.4. Power supply unit 24V DC

Power supply unit 24V DC, 2,5A is designed for DINA rail mounting. It is used for supply of control sections, thermostats and thermo-drive units. One unit can supply up to 50 pieces of thermo-drive units and in case of bigger systems there can be installed more power supply units together. Power supply unit is a part of control section RNET_P4 delivery.



2.3. Optional accessories

2.3.1. End item

End item KC_NET is designed to control heat source: boiler or heat pump. If the control section finds out that all thermo-drive units are closed, it sends to the end item instruction for heat source shutdown. If at least one of thermo-drive units is open, end item gets instruction to start heat source.

KC_NET is very suitable for the regulation systems where the heat source is electric boiler, gas boiler or furnace oil boiler. On the other hand, KC_NET is not suitable for hot-water storage systems and for all systems where at the boiler room level the equithermic regulation or boiler cascade sorting is needed. Equithermic regulation is solved by BMR controller ETR16.

End item is connected to the same bus as the rest of system components.

Function description:

- Red LED On – module under operation
- Green LED On – contact No. 4 – 5 is open, contact No. 4 – 6 is closed. Boiler is working.
- Green LED Off – contact No. 4 – 5 is closed, contact No. 4 – 6 is open. Boiler is out of operation.



2.3.2. LOW modem

LOW_MODEM allows in conjunction with GSM gate or telephone communicator, remotely switching the regulator over, from comfortable heating mode to the saving mode ("LOW" mode) and back.

By SMS messages, contact status of GSM gate is controlled.



Note

Low is connected to the system on the same bus as other items. Once the LOW_MODEM is installed into the system, it is possible to control mode changes only by SMS GSM gate. Manual switching on control section is disabled. For enabling the manual changes of LOW mod, power supply of LOW_MODEM must be disconnected.

Function description:

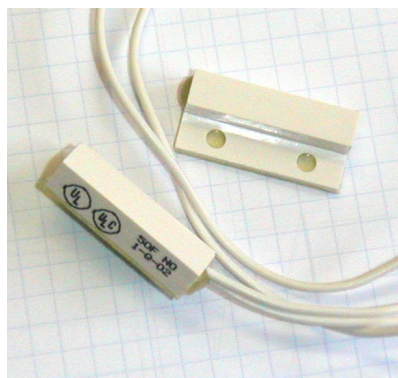
- Red LED on – module in the operation.
- Green LED off – terminals No. 4 – 5 closed, control section heats according to set mode.
- Green LED on – terminals No. 4 – 5 opened since GSM gate gives signal for control section and it switches to the LOW mode.



2.3.3. Window contact

Window contact OK_NET provides information about the window status (open/close) in the regulated room. It is connected directly to the sensor and includes reed contact, which reacts on the closeness of the permanent magnet. Contact itself is mounted on the window frame and magnet is fixed on the window. If the window is open, then programmable thermostat disconnects appropriate circuit via thermo-drive unit.

If the room temperature drops below 8°C, programmable thermostat opens thermo-drive unit (protection against low temperature in the room).



2.3.4. An interface for a PC control

Personal computer is connected to the control section via RS485 line and converter RPC_USB or RPC_RS232.

On the one RS485 line can be placed one and more control sections and be controlled from the same software. Every control section has unique ID number to be identified on the RS485 bus. This ID number may be set in the service menu of the device. Computer does not work as control unit but only as a data repository or as a system monitoring station and configuration tool. This computer does not need to run 24 hours every day and other application may run at this computer as well. System control section is therefore absolutely independent. By software it is possible to change temperature modes, set LOW mode, define time tables and monitor whole system etc. Control software is designed for MS Windows systems and includes protection features to prevent unauthorized usage (for example password system for different user levels).

2.4. The design and installation of the control system

Installation of regulation system is easy and logical. If the operation steps are followed it should be without any complication working on the first connection.

Design procedure:

1. **Investigate placement of all thermostats, thermo-drive units and expected cable length.** Those information are essential for decision about the communication network topology. Cabling is done by three-wires line: power supply 24V (+), (-) and data line (L). Thermostats and control sections are identified by unique ID number. Basic network topology is bus network. It means that device are connected directly in parallel on the the three-wires bus. In case that particular conditions are fulfilled, system allows to make modification for specific installation requirements. See connection diagrams at appendix.
2. **Define number of thermo-drive units.** This information is needed for power supply unit definition. If the total number of used thermo-drive units is higher than 50 pieces, another power supply unit has to be installed.
3. **Define number of thermostats.** One control section is able to operate up 32 control channels. If the number of used thermostats is higher, than another control section has to be used. System can be based on maximum 16 control sections.
4. Additional information. Mainly requirements on end-item usage, LOW mode, software, combination of regulation etc.

From above listed information, appropriate connection diagram is chosen. See connection diagrams at appendix.

Important

It is very important to design system with attention on minimalization of power supply and communication length and minimaization of power loses on this line.

Considering the fact that one thermo-drive unit has power consumption about 1,5 W, than while using more thermo-drive units, power load can be high. Therefore during the designing process the cable diameter must be considered to assure that voltage drop at the line end will be not more than 3 V.

For small systems with total number of used thermo-drive units less than 15 pieces, the cable diameter can be 0,8 mm². For larger systems the cable diameter has to be at least 1,5 mm².

Table of recommended cable types for three-wire line:

Number of thermo-drive units and cable length	Cable type	Note
< 15 units, cable circuit < 30 m	SYKY, SYKFY3x2x0,5	It is recommended to twist pair cables together and create three-wire cable. Shielding is not connected.
< 25 units, cable circuit < 100 m	JYTY 3x1,0	Shielding not connected.
> 25 units, cable circuit max. 300 m	CYKY 3x1,5	Use auxiliary terminals in the thermostat.

Attention

In the system can be maximally 3 power line branches connected in parallel. Every parallel branch has some capacity, which is counted together with other branches and complicates data transmission.

Connection of thermo-drive unit (24 V type) is most often realized by cable type SYKY 2x2x0,5 or any other two-wire cable with similar minimum diameter. For connection of thermo-drive units (230 V type) is necessary to use cable for higher working voltage and RCB protection.

At thermo-drive unit connecting box must be installed. Inside this box the connection between cable from thermo-drive unit (0,5 m length) and cable from thermostat is realized. If there is more thermo-drive units in the room, then all units are connected in parallel and to the sensor just one two-wire cable is brought. Maximum number of thermo-drive units connected to one thermostat is 10 units.

It is better to mechanically protect thermo-drive units against damage in special applications like, for example schools, sport clubs and hotels. It is also recommended to move thermo-drive units to position so they will be less visible.

Thermostats should be placed at the inner un-cooled wall at level of standard light switch (150 cm above the ground).

Thermostats must not be placed to following position:

- Close to heat sources
- On the place with direct sunlight
- Behind the case, sofa or any other obstruction

- Under the ceiling
- Other places where temperature measurement affection is possible

Recommendation for installation:

- End item, if it is used, should be placed close to boiler or valve which will control
- Window contact is connected directly to the thermostat
- Control section may be placed according to customer request. For all application it is recommended to place control section into the center of cable network.

By observing all above listed rules, system installation will not be giving any complication and system will fully work on the first start.

2.5. Technical features

Parameter	Value
Supply voltage	230 VAC / 24 VDC max. 2,5 A
Power consumption of control section	0,3 VA
Power consumption of thermostat	0,2 VA
Power consumption of end item	0,2 VA
Power consumption of LOW modem	0,2 VA
Maximum number of independently controlled channels RNET	32
Control voltage for thermo-drive units	24 VDC
Maximum number of thermo-drive units per one channel	10
Temperature measurement range	-10 to 50°C
Temperature measurement accuracy	1°C
Date and time backup	24 hours
Configuration backup	10 years

3. RT – control system for direct electrical heating

Regulators RT can control heating in direct electrical heating systems with electrical heating convectors, heating cables, heating matting and foil in floors or walls. By RT regulator it is also possible to control infrared heaters.

System RT is based on the control station and switching unit, into which all analogue temperature sensors and heating devices are spoke wisely connected (star topology). Digital sensors can be also used in the system and those are connected onto the three-wire bus.

Switching unit is internally connected via three-wire bus to the control station. Both units create system which is able to control heating in up to 32 independent circuits.

Power switching is realized by semiconductor switches. Normally, by one channel, power up to 3 kW can be switched. On the request, it can be increased up to 5 kW. For bigger powers it is possible to control several power channels at the same time by one thermostatic sensor.

Important

Switching power semiconductors has to be well cooled. Power control unit is designed so the natural ventilation is cooling power semiconductors. Vent hole has to be free and uncovered. Maximum power level limit for the appropriate size of power control unit must be strictly followed. See hereinafter.

Also electric heating control system can be equipped by additional items. Basic system contains control section, power control unit and thermostatic elements. Additional elements like for example GSM modem and communication interface for PC and software can be used.

Important

Parameter setting of number of sensors, rooms and coupling between sensors is made at the production according to customer detailed specification. Installation has to be made according to room specification, which is a part of the regulator. Later change is possible to be made only by reprogramming the switching unit at the producer.

Digital room temperature sensors for RT system are not only passive temperature sensors, but they are based on intelligent microprocessor control, which provides data and commands exchange between sensor and control section. Every single element of the system is identified by unique address defined by switches on the sensor. Other

special devices, for example end item, are identified by unique address defined by producer. Analogue sensors do not have any identification and have to be connected according to specification onto adequate position of power control unit terminal.

Analogue floor and air sensors are passive temperature sensors without any intelligence.

At the regulation system RT, thermostatic sensor doesn't need to represent one single control channel of system. One sensor can control more power channels. One power channel can be controlled by two sensors. This advantage is often used for systems combining floor heating and heating convectors. Floor sensor controls set maximum floor temperature and air sensor controls room temperature. In the case of exceeding set temperature of one of those sensors, an appropriate power channel will get disconnected.

Maximum number of connected sensors (analog or digital) in any combination is 32 units. System uses centralized ripple control of load for low tariff. If the signal is missing, switching unit disconnects all heating devices.

System uses centralized ripper control of load for low tariff. If the signal is missing, switching unit disconnects all heating devices.

3.1. Description of parts

Regulation system RT is based on elements, which can be defined as two following groups:

- **Basic elements.** Basic elements are necessary for every regulator and neither one can be left out. Basis for the system is control section, power control unit, programmable temperature sensors, floor sensors and protection devices.
- **Additional elements.** Additional elements increase comfort and improve some features of regulation system. However their usage is not essential. In the group of additional elements there can be found:
 - window contact OK_NET
 - LOW modem for GSM control
 - interface RPC_USB for remote control via PC

3.2. Basic elements

3.2.1. Control section

Control station RNET_P allows to set day or week regulation programs for 32 independent heating circuits. It shows real temperature in every circuit and allows its precise calibration directly from control section.

Up to 8 times per day, the temperature may be changed and it can be at any time and on any requested value. Alphanumerical display with 2 x 16 digits shows all information to the user and comfortable keyboard with 16 keys allows easy operation.



Control station has two operation modes. User mode allows checking temperatures at every room, defines heating profiles, etc. Service mode is protected by password and it provides menus for essential settings, like for example number of sensors, dates for time changes, temperature calibration for every sensor and others.

Heating at every room may be programmed independently on the rest of the building and for every day of week separately. For example, it may have different heating profiles for the working days and weekend.

All system or just selected part can be easily switched to the economic heating mode (LOW mode) and back to the

comfort mode directly from the central station, computer or remotely via GSM gate.

Technical features:

Supply voltage	24 V DC
Consumption	0,3 W
Date and time backup	24 hours
Configuration backup	10 years

If the system is connected to the PC it is necessary to install cable for RS485 bus to the computer where converter RS485/USB or RS485/RS232 is placed. See connection diagrams at appendix.

3.2.2. Power control unit

Regulation unit gets requested temperature value for appropriate heating circle at defined time from control station. Real temperature of the room or floor temperature is being found out by connected sensors. For RT control system two types of temperature sensors are available:

- **Analogue temperature sensors.** Temperature sensors which are connected via two-wires line directly to control station.
- **Digital temperature sensors.** Sensors are connected via three-wire line (24V (+), (-) and communication line L). Sensors are intelligent and have additional functions.

Real temperatures are compared with requested values and according to the results appropriate power semiconductor elements are controlled. Heating devices are directly operated by semiconductor switches.



Control process by power semiconductor switches is absolutely silent and does not generate any disturbances into the network. Another very important advantage is high switching rate (lifetime doesn't depend on the number of operations) which assures excellent accuracy of regulation. Heating device is being regulated to provide exact heating power in order to keep the requested temperature. This excellent operation saves consumed energy and reduces the cost of the heating.



Note

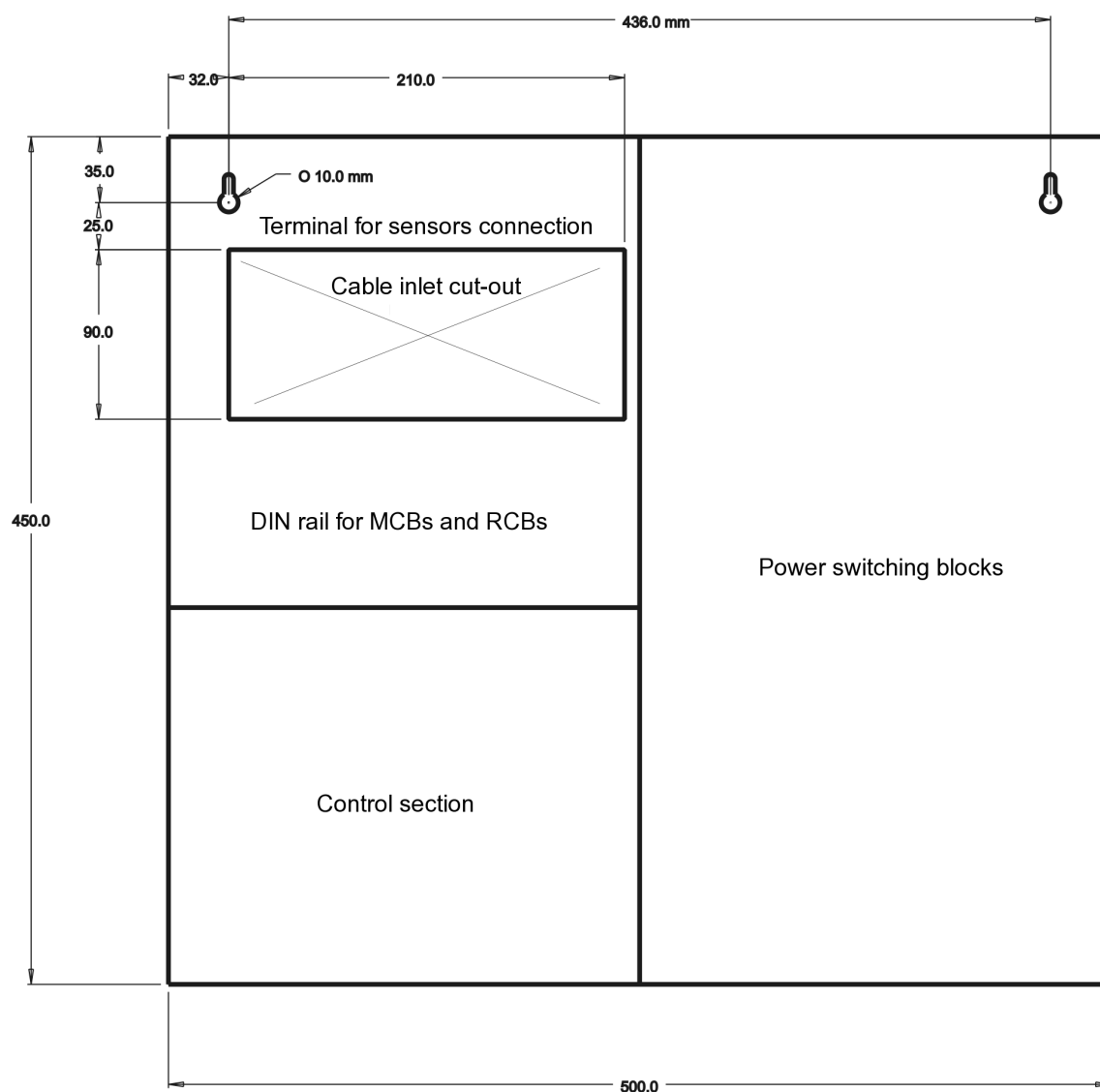
MCB and RCB are not a part of delivery. Nevertheless the case of power control unit is ready for their installation.

Power control unit is delivered in white color RAL9003 in three dimensions according the number of power channels:

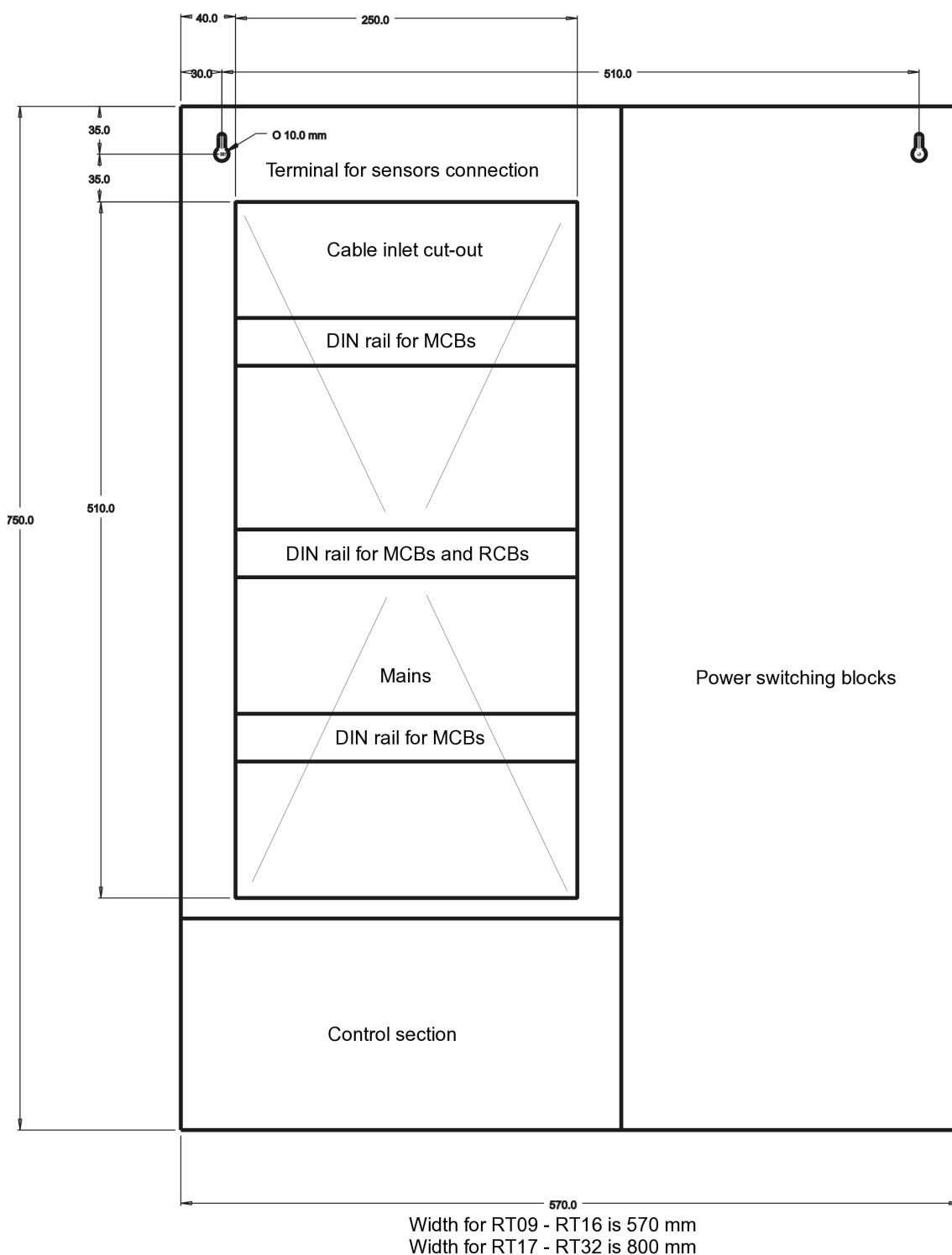
- RT04 – RT08 max. 15kW (width x high x depth 500 x 450 x 80 mm, concealed frame 560 x 670 x 140 mm)
- RT09 – RT16 max. 30kW (width x high x depth 570 x 750 x 80 mm, concealed frame 630 x 970 x 140 mm)
- RT17 – RT32 max. 60kW (width x high x depth 800 x 750 x 80 mm, concealed frame 860 x 970 x 140 mm)

Detail dimensions of RT cases:

Picture No.1 Dimensions of RT04 – RT08



Picture No. 2 Dimensions of RT09 – RT16, RT17 – RT32



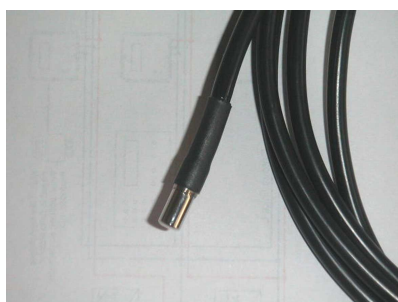
3.2.3. Analogue temperature sensors

Analogue temperature sensors are in two designs

Temperature sensor RT_L. Sensor is designed to be placed on the inner wall to the high of 120 – 150cm. It is produced only in blind design and it is possible be mounted on recessed box KU 68 or surface mounted box which can be supplied together with sensor.



Floor sensor RT_P. Sensor is designed for floor temperature measurement and it is in the shape of metal roller with diameter of 6mm and length of 20mm. Due to the fact that in the floor heating it is very important not to exceed maximum allowed temperature, it is necessary to place this sensor on the best place, considering the floor type, in order to measure directly the floor temperature or temperature of heating medium.



Analogue sensor RT_L is available at design ABB (Tango, Element, Time, Alpha Exclusive Palladium or Titan), Schneider – Telemecanique (Unica TOP, Unica Plus, Unica Colors and Unica Basics). Other designs on the request.



Important

All sensors measure with accuracy 1°C. This accuracy is absolutely sufficient for measurement of room temperature. Nevertheless sensor can be calibrated on higher accuracy.

3.2.4. Digital temperature sensors

According to the customer request three types of thermostats can be delivered.

RT_NET. Programmable thermostat with built-in temperature sensor presents independent regulation unit, which works as a PI (proportional integration) regulator and communicates with control section, from which receives information about requested temperature and vice versa it sends information about measured temperature.



RT_NET_D. Sensor is equipped by LCD on which real room temperature, window contact status and high tariff presence is shown. Measured room temperature is as a digital information to the central station via communication bus.



RT_NET_DN. Comparing to the RT_NET_D this temperature sensor offers also local temperature change independently on the set program in control section. This manual temperature change is valid until the next temperature change according to time table is made by control section. Other features and functions are the same as for previous sensor type.



Digital sensors are available at design ABB (Tango, Element, Time, Alpha Exclusive Palladium or Titan), Schneider – Telemecanique (Unica TOP, Unica Plus, Unica Colors and Unica Basics). Other designs on the request.



Important

All sensors measure with accuracy 1°C. This accuracy is absolutely sufficient for measurement of room temperature. Nevertheless sensor can be calibrated on higher accuracy.

3.2.5. Control of electrical floor heating

System RT can control also electrical floor heating systems based on heating matting or foil. To the design procedure of heating system with floor heating elements it is used the same method as for direct electrical convectors. For the floor temperature measurement sensors RT_P are used.

In case of combined heating by direct electrical convector and floor heating, it is possible to configure regulator so, that air sensor in the room controls as power channel of convector as power channel for floor heating. Floor sensor provides information about the floor temperature to control maximum floor temperature. User is setting maximal temperature for floor and requested temperature for air-sensor. Working procedure is described on following example:

Requested floor temp.	Measured floor temp.	Requested air temp.	Measured air temp.	Status
20°C	18°C	24°C	22°C	floor – on, convector – on
20°C	21°C	24°C	22°C	floor – off, convector – on
20°C	19°C	24°C	25°C	floor – off, convector – off

3.3. Optional accessories

3.3.1. RTR concealed frame

Power control units are produced in three dimensions. Smallest size can control heating system maximally in 8 circuits, medium size in 16 circuits and biggest size in 32 circuits. All three sizes are standardly mounted on the wall surface. For all three types the special concealed frame is offered. This frame allows power control unit be recessed into the wall. Special frame is needed due to better cooling of power semiconductors.



3.3.2. LOW modem

The same as for RNET system.

3.3.3. Window contact OK_NET

Window contact OK_NET is possible to be connected in series with analogue or digital temperature sensor. If the window is open, then sensor is disconnected from the regulator which switches off appropriate channel. For digital sensor, window contact can be connected to the special terminals for that purpose. Both types of window contacts (NC and NO) can be used but during the central section parametrization the correct type of window contact has to be defined.

Others the same as for RNET system.

3.3.4. Remote control of electrical floor heating from PC

The same as for RNET system.

3.4. Design and installation of regulation system

Installation of regulation system is easy and logical. If the operation steps are followed it should be without any complication working on the first connection.

Design procedure:

5. **Define placement and the number of analogue sensors.** All analogue sensors are connected in the spider network (spoke wisely). From every sensor pair-wire comes directly to regulator (central station). Recommended cables are SEKU 2x0,8 or SYKY and SYKFY 3x2x0,5. Paralleling with power line is not forbidden. Shielding is not required.
6. **Define placement and the number of digital sensors.** Digital sensors are connected into the bus network. Devices are connected in parallel one by one via three wires line. **Used cable has to be in shielded design**, for example SYKFY 3x2x0,5. Shielding is connected at every sensor and central station with power supply negative (-) terminal. **Paralleling with power line is not allowed.**
7. **Specify heating system parameters in the order.** Control station is programmed according to the heating system configuration and it is impossible those parameters changed on place of installation. Installation user guide and parametrization of the regulator is placed inside the door of every RT power control unit. Installer has to precisely follow connection diagram otherwise regulator will not work properly.
8. Specify additional information about the system and request. Mainly requests for usage of end item, LOW modem, software, system combination etc.
9. names or numbers of rooms
10. for every room sensor type specification (analogue or digital and type) or combination of sensors for example floor and air sensor.
11. Expected power consumption of heater in kW.
12. **Assure power supply cables dimension from heaters to RT control unit and their protection.** For heaters is necessary to use cables with diameters exactly according to standards.
13. **Assure unblocked power supply.**
14. **Assure Centralized Ripple Control supply of control "Zero"** from utility switching device placed in the main switchboard.
15. Provide additional information. Mainly requests for modem, software, regulation combination usage etc.

According to above listed information the type of regulation connection diagram is selected. Connection diagrams are annexed to this document.



Important

It is very important to design system with attention on minimalization of power supply and communication length and minimaization of power loses on this line.

Control section is placed directly inside the regulator (power control unit) but it can be installed independently on the wall. For external mounting of control section use the same cable as for digital temperature sensors. Control section can be installed up 300 m from the regulator (power control unit).

If for larger installations, temperature sensors do not communicate well with control section and connection is correct and verified, modify the communication line by connecting additional resistor of 1,5 kΩ. Resistor is connected between the terminal (-) and communication line (L).

It is recommended to consider usage of current limiting device HJ303 or HJ306. That device allows to decrease main circuit breaker about 2 stages. Connection diagram of current limiting device HJ in the RT system is shown on the enclosed connection diagrams at the appendix.

For the temperature sensors placement follow the same rules as for thermostats of RNET system.

By observing all above listed rules, system installation will not be giving any complication and system will fully work on the first start.

3.5. Important instruction for installation

Before installation itself please read carefully following basic instructions:

16. **Regulator RT is electrical device, which can be installed only by person with appropriate electro-technical qualification and approved certification from BMR for installation of RT systems. Installation provided by unauthorized person cannot be covered by warranty.**
17. **RT device is classified as a regulator. It is not classified as an electrical switchboard.**
18. Regulator is configured by producer according to the customer requests and therefore it is impossible to make changes lately like, for example number of power channels or sensors. If the change is needed please contact producer.
19. Regulator is delivered without MCBs and RCBs. Positions on DIN rail are reserved, in preference, for MCBs.
20. RCBs have to be installed if heating cable without conductive braiding is used. The heating cable with conductive braiding and RCB has to be used in the bathrooms. RCB has to have nominal trigger current up to 30 mA. For heating cables RCBs have to be installed for every channel independently. For heating foils one three-phase RCB can be used for all channels.
21. Installer is not allowed to modify or even work on regulation part of the RT system!
22. Regulator (power control unit) must not be placed outdoor or wet place!
23. Ventilating aperture must not be covered by anything. Without the producer knowledge and permission, the regulator (power control unit) must not be installed into the parent switchboard.
24. **Power supply and remote ripple control has to be from the same phase!**
25. Into the regulator the signal wire from remote ripple control has to be connected.
26. Any actions on the regulator connection have to be operated only under disconnect regulator (power control unit).
27. All channels and sensors have to be connected exactly on the right positions according to the room list and connection diagram which a part of delivery and it is enclosed in the regulator.
28. **Regulator RT must not be used for power switching via relays!** Power channels are directly switching by semiconductors in the regulator (power control unit).
29. Keep the regulator without any action for about 10 minutes after power supply connection. Device is doing initial communication with control section and temperature sensors. Every action on the control section prolongs that initial communication.
30. User manual and service manual is available for installer. Service manual should not be available for end user.
31. RT system is maintenance less, except regular revisions.

3.6. Technical features

Parameter	value
Supply voltage	3 x 400 VAC / 50 Hz
Maximum power of standard switching channel	3 kW
Maximum power of tuned switching channel	5 kW
Power consumption of control section	0,3 VA
Power consumption of temperature sensor	0,2 VA
Power consumption of LOW modem	0,2 VA
Maximum number of independently controlled channels RT	32
Control voltage for thermo-drive units	24 VDC
Temperature measurement range	-10 to 50°C
Temperature measurement accuracy	1°C
Date and time backup	24 hours
Configuration backup	10 years

4. Electrical heat storage system control

4.1. Description

Regulators of RNET range may be used also for control of dynamic block storage heater.

Regulation system elements are the same as for system RNET. There is only one difference - programmable thermostats do not control thermo-drive units. Instead of this, block storage heater discharging is controlled by switching the ventilator on/off, via auxiliary relay.

This regulation system does not have sense to be quipped with end-item, since there is not available central heat source.

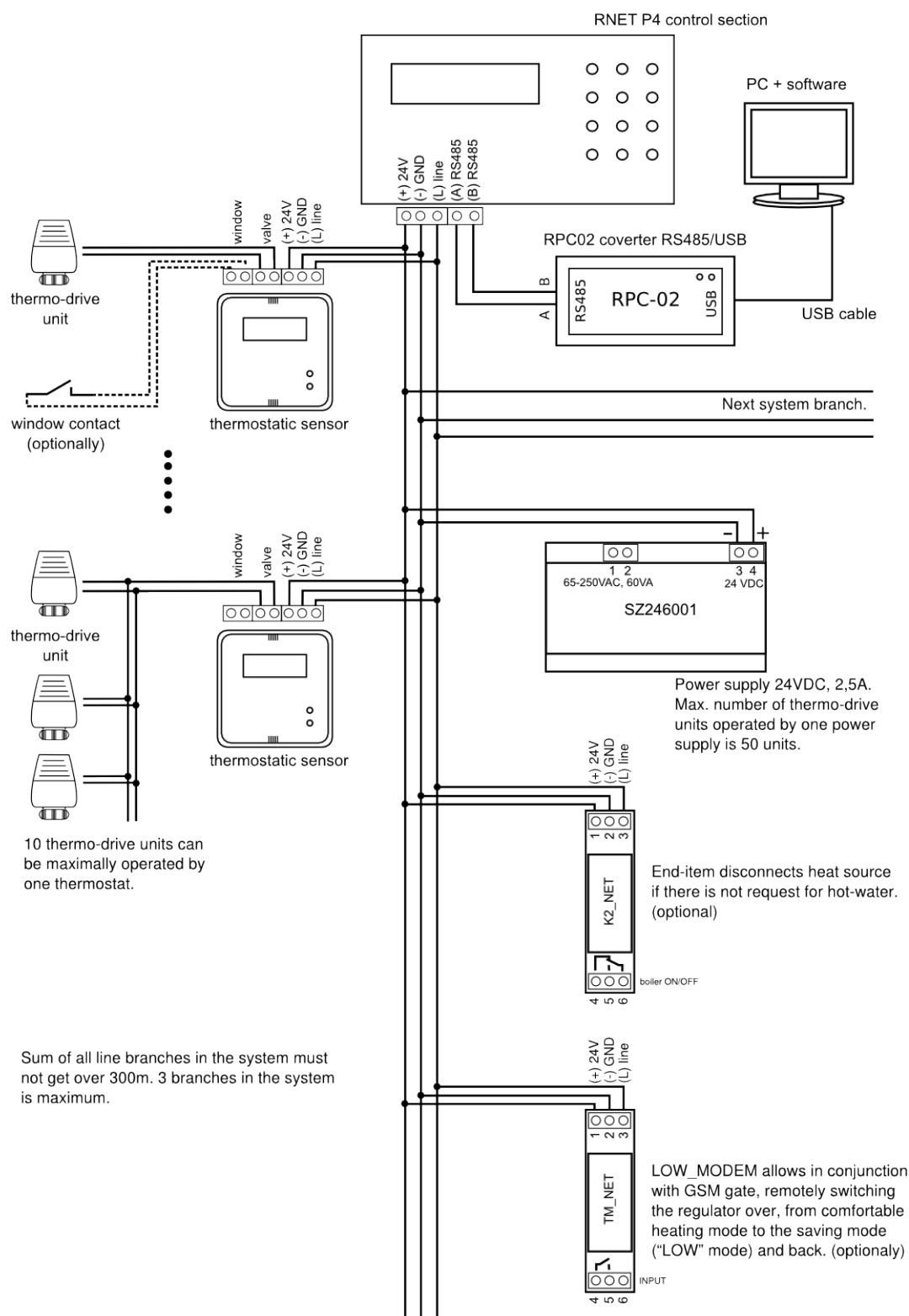
More information are available at the part of RNET system and all rules for design and installation are followed the same rules.

5. Control of combined systems

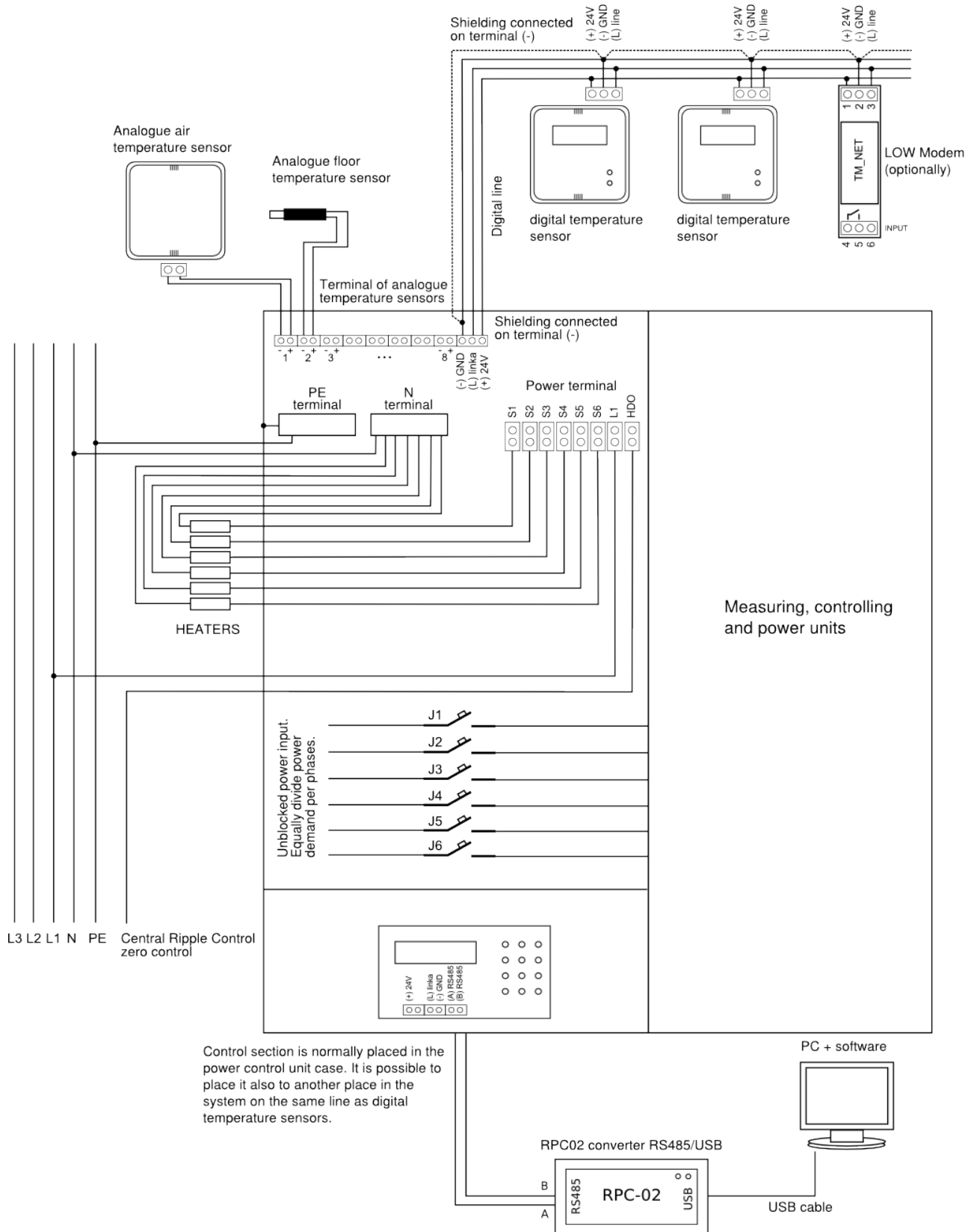
One of the very important advantages of BMR heating controllers is capability to control combined heating systems. Due to this feature, it is easy to solve application where building is heated by, for example, electrical block heaters with direct electric radiators.

BMR technical team is ready to provide help for such specific application and supply complete solution.

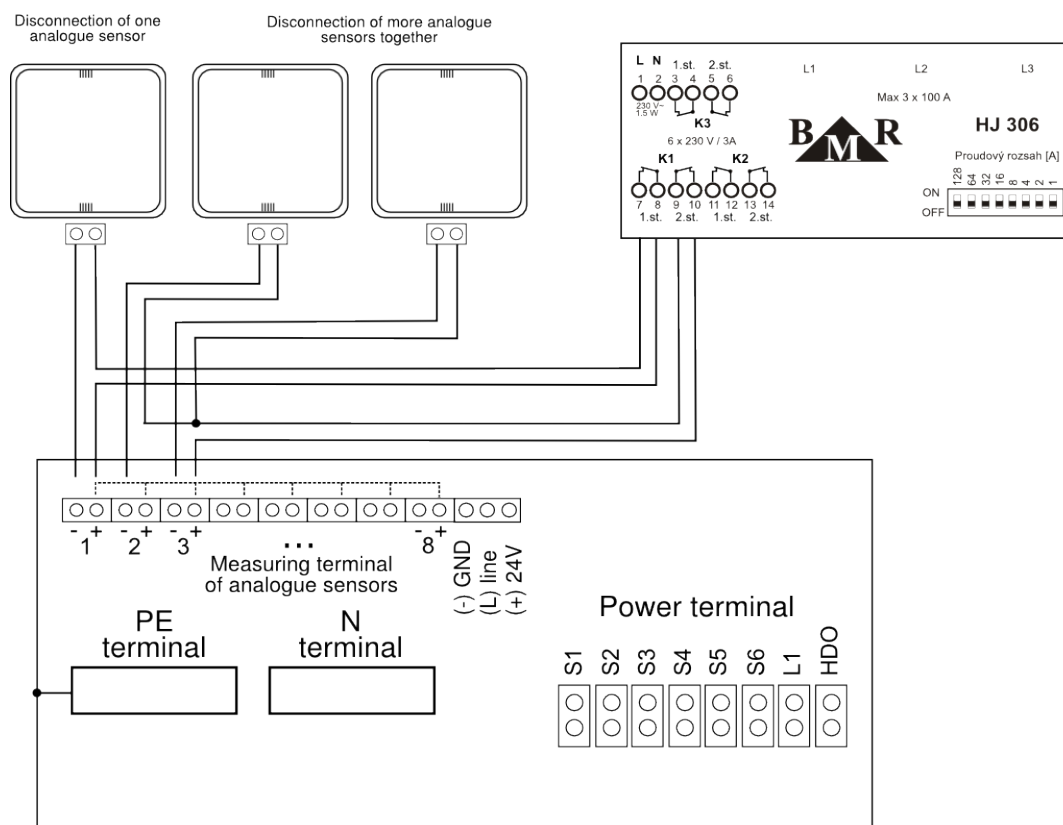
Connection diagram of control system RNET for hot-water heating



Connection diagram of control system RT for direct electric heating



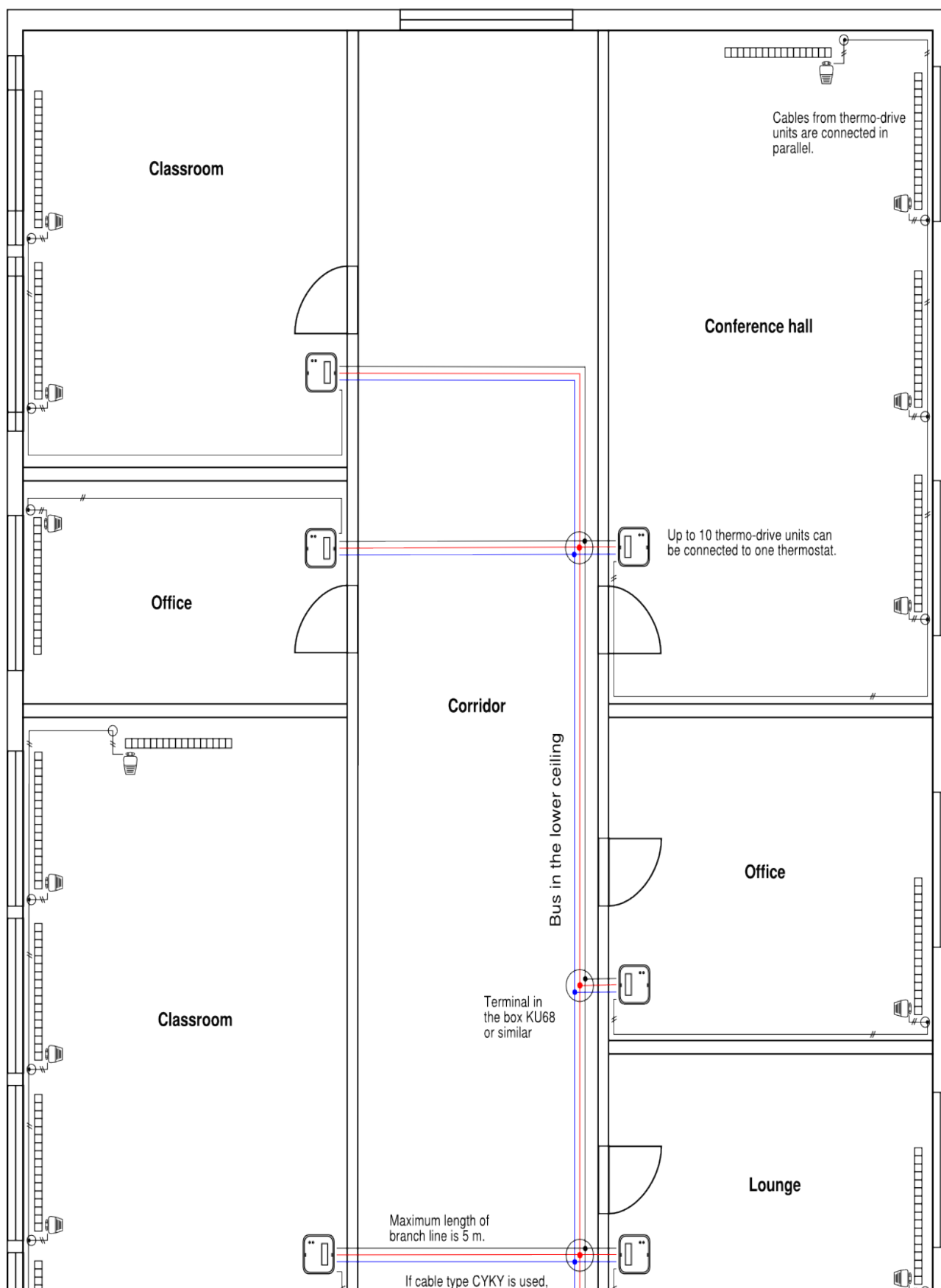
Connection diagram of RT system and current controller HJ306



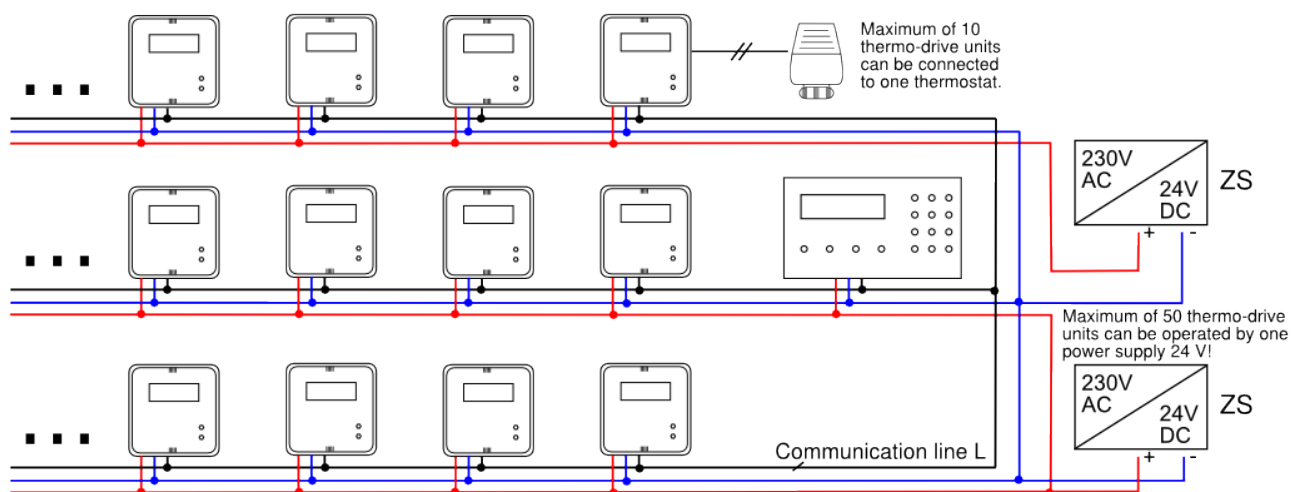
Cooperation of HJ 30x and regulator RT is based on the disconnection of analogue sensors from the regulator (power control unit). When analogue sensor is disconnected by HJ 30x, regulator disconnects appropriate circuit too. For analogue sensors disconnection is necessary to use wire coming from terminal PLUS because terminal PLUS is common and in case of grouped sensors it is possible to disconnect whole group by one HJ 3xx contact.

If two sensors are used in the system (floor sensor and air sensor) for heating regulation at one room, only the floor-sensor has to be disconnected.

Installation diagram of RNET system in office buildings, hotels and schools

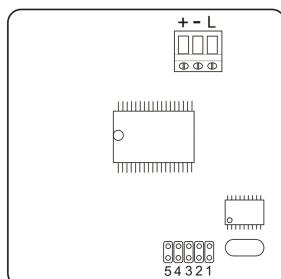


Connection diagram of larger RNET system with two power supplies of 24V



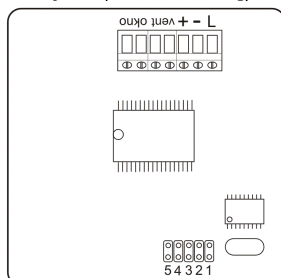
Connection and ID number setting for sensors of RT and RNET systems

Temperature sensor for RT system
(electric heating)



L (line)
+ (24V +)
- (24V -)

Thermostatic sensor for RNET
system (hot-water heating)



L (line)
+ (24V +)
- (24V -)
vent (thermo-drive unit terminal)
okno (window contact terminal)

ID number switch combination of sensors RT and RNET			
sensor ID	Combination	sensor ID	Combination
1	5 4 3 2 1	17	5 4 3 2 1
2	5 4 3 2 1	18	5 4 3 2 1
3	5 4 3 2 1	19	5 4 3 2 1
4	5 4 3 2 1	20	5 4 3 2 1
5	5 4 3 2 1	21	5 4 3 2 1
6	5 4 3 2 1	22	5 4 3 2 1
7	5 4 3 2 1	23	5 4 3 2 1
8	5 4 3 2 1	24	5 4 3 2 1
9	5 4 3 2 1	25	5 4 3 2 1
10	5 4 3 2 1	26	5 4 3 2 1
11	5 4 3 2 1	27	5 4 3 2 1
12	5 4 3 2 1	28	5 4 3 2 1
13	5 4 3 2 1	29	5 4 3 2 1
14	5 4 3 2 1	30	5 4 3 2 1
15	5 4 3 2 1	31	5 4 3 2 1
16	5 4 3 2 1	32	5 4 3 2 1



Note:
Connection polarity of thermo-drive unit and window contact is not important